INDOOR AIR QUALITY REASSESSMENT

District Court of Southern Norfolk County
(Stoughton District Court)
1288 Central Street
Stoughton, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
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Background/Introduction

In response to a request from the Administrative Office of The Trial Court (AOTC), an indoor air quality assessment was done at the Stoughton District Court (SDC), at 1288 Central Street, Stoughton, Massachusetts. This assessment was conducted by the Massachusetts Department of Public Health (MDPH), Bureau of Environmental Health Assessment (BEHA). Concerns about symptoms occupants believe to attributed to poor indoor air quality prompted the request.

On June 5, 2002, Michael Feeney, Director of Emergency Response/Indoor Air Quality (ER/IAQ), made a visit to this building. Mr. Feeney was accompanied by Cory Holmes, Environmental Analyst in the ER/IAQ Program and for portions of the assessment Justice Frances T. Crimmins, Jr., Michael Hayes, Project Administrator, AOTC and Donald Stapleton, Clerk Magistrate, SDC.

The SDC is a single-story, red brick building, with an occupied basement constructed in 1962. Interior modifications were being conducted during the BEHA assessment including asbestos removal and the installation of an elevator. The main floor consists of the pre-trial courtroom, law library, small claims & clerks civil office, main district court room, the superior court room, probation office and judge's lobbies. Located on the basement floor are the DA's office, several conference rooms, criminal clerk's office, boiler room, maintenance/janitorial space, detention room and holding cells. Windows are single-paned sash design and are openable throughout the building.

The building was previously evaluated by the Massachusetts Department of Labor and Workforce Development (MDLWD), in 2000. The MDLWD report made the following recommendations:

- Do not occupy rooms that lack ventilation;
- Unblock ventilation units and repair units that are too noisy and/or lack temperature control;
- Ensure windows are operable and use windows in the building to provide natural ventilation;
- Have the HVAC system in the main courtroom examined by an HVAC engineering firm;
- Restore mechanical ventilation to the lower courtroom and lock-up according to design specifications;
- Operate all ventilation systems in the fan "on" mode during occupation;
- Prevent smoking within the building;
- Repair leaks and ensure all water damaged areas are dried, cleaned and decontaminated, remove and replace water damaged porous materials that are not dried out within 48-72 hours;
- Repair floor drains in lower level bathrooms to prevent backup;
- Consider the installation of ceiling fans to provide air circulation; and
- Develop an indoor air quality management plan (MDLWD, 2000).

Methods

Air tests for carbon dioxide, temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor.

Results

These offices have an employee population of approximately 60. Approximately 150-200 individuals visit the SDC on a daily basis. Tests were taken under normal operating conditions and results appear in Tables 1-4. Air sampling results are listed in the tables by location, function or occupant's last name.

Discussion

Ventilation

It can be seen from the tables that carbon dioxide levels were above 800 parts per million parts of air [ppm] in thirteen of twenty-six areas, which is indicative of inadequate air exchange in fifty percent of the areas surveyed. Mechanical ventilation in the building is provided by a combination of air handling units (AHUs) (main courtroom, lock-up) and unit ventilators (univents), which are located in areas such as the civil/small claims office. AHUs draw outside air through an air intake and distribute conditioned air through ceiling or wall-mounted diffusers. Exhaust air is drawn into wall-mounted vents that return air back to the AHU. A new heating, ventilation and air conditioning (HVAC) system was reportedly being installed in the main courtroom at the time of the assessment.

Univents draw air from outdoors through a fresh air intake located on the exterior walls of the building and return air through an air intake located at the base of each unit (see Figure 1). Univent air intakes appeared undersized (see Picture 1) when compared to other buildings equipped with univents (see Pictures 1A and 1B for examples). Limiting fresh airflow into the univent can lead to a reduction in fresh air distribution as well as difficulty in controlling temperature.

Fresh and return air are mixed, filtered, heated and provided to classrooms through an air diffuser located in the top of the unit. Univents were found deactivated in all areas surveyed, reportedly due to lack of temperature control, noise or other malfunctions, which can indicate problems with the pneumatic system or thermostatic control. Obstructions to airflow, such as items stored on univents and cloth partitions in front of univent returns were seen in some areas (see Picture 2). In order for univents to provide fresh air as designed, intakes must remain free of obstructions. Importantly, these units must remain "on" and be allowed to operate while rooms are occupied.

During the BEHA assessment none of the buildings mechanical ventilation systems were operating. Without dilution and/or removal by the supply and exhaust ventilation systems, normally occurring environmental pollutants can build up and lead to indoor air complaints.

To maximize air exchange, the BEHA recommends that both supply and exhaust ventilation operate continuously during periods of occupancy. In order to have proper ventilation, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. The date of the last balancing of these systems was not available at the time of the assessment. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994).

The Massachusetts Building Code requires a minimum ventilation rate of 20 cubic feet per minute (cfm) per occupant of fresh outside air or have openable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that the room is occupied. Providing adequate fresh air ventilation with open windows and maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being exceeded. When this happens a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week based on a time weighted average (OSHA, 1997).

The Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches. For more information concerning carbon dioxide, see Appendix I.

Temperature measurements ranged from 71^{o} F to 77^{o} F, which were within the BEHA recommended comfort range on the day of the assessment. The BEHA recommends that indoor air temperatures be maintained in a range of 70^{o} F to 78^{o} F in order to provide for the comfort of building occupants. A number of occupant complaints of poor ventilation and uneven heating and cooling were reported. In many cases concerning indoor air quality, fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply.

The relative humidity in the building ranged from 36 to 65 percent, which was both above and below the BEHA recommended comfort range in some areas. The BEHA recommends a comfort range of 40 to 60 percent for indoor air relative humidity. During periods of high relative humidity (late spring/summer months), windows and exterior doors should be closed to keep moisture outdoors. In addition, the ventilation should be activated to control moist air in the building.

The combination of inactive ventilation systems and open exterior doors and windows can cause indoor relative humidity levels to rise. While temperature is mainly a comfort issue, relative humidity in excess of 70 percent can provide an environment for mold and fungal growth (ASHRAE, 1989). Moisture removal is important since the sensation of heat conditions increases as relative humidity increases (the relationship between temperature and relative humidity is called the heat index). As indoor temperatures rise, the addition of more relative humidity will make occupants feel hotter. If moisture is removed, the comfort of the individuals is increased. Removal of moisture from the air, however, can have some negative effects. The sensation of dryness and irritation is common in a low relative humidity environment. Relative humidity levels in the building would be expected to drop during the winter months due to heating. Low relative humidity is a very common problem during the heating season in the northeast part of the United States.

Microbial/Moisture Concerns

Of note is the D.A.'s Office, located on the ground floor in the northwest corner of the building. The ceiling tiles in this room appear to intact, but are noticeably sagging. In the experience of BEHA staff, sagging ceiling tiles can be an indication of an uncontrolled source of water vapor being introduced. Several possible sources of water/water vapor exist in the D.A.'s Office:

1. Located immediately adjacent to the D.A.'s office is a restroom which contains a shower, that is operational and reportedly used. No exhaust fan exists in this shower/restroom. Water vapor produced from shower use is not vented from the building, but rather diffuses into the building, the closest area being the D.A.'s Office.
2. The fresh air intake for the univent in this area is located near the bottom of a subterranean cement lined pit (see Picture 3). While a drain exists in the floor of the pit, the cements walls appeared to be moistened. Operation of the univent can draw water vapor from this pit.
3. An air conditioner is installed in the upper portion of a window. It appears that the air diffuser is at a level that directs air toward the suspended ceiling. Under certain circumstances and operational condition, the air stream produced by a window-mounted air conditioner can generate moist air. If this moistened air is injected into the ceiling plenum, it may result in water vapor contact with the ceiling system, causing in sagging tiles.
4. Shrubbery exists in close proximity to the foundation walls (see Picture 1). The growth of roots against the exterior walls can bring moisture in contact with wall brick and eventually lead to cracks and/or fissures in the foundation below ground

level. Over time, this process can undermine the integrity of the building envelope and provide a means of water entry into the building via capillary action through foundation concrete and masonry (Lstiburek, J. & Brennan, T.; 2001).

Each of these observations of potential water vapor in the DA's Office can result in moistened ceiling tiles. The solution to this problem would be to remove water vapor by use of exhaust ventilation. Repeated moistening of porous materials without sufficient drying time may result in mold growth. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24 hours of becoming wet (ACGIH, 1989). If materials are not dried within this time frame, mold growth may occur. Once mold has colonized porous materials, they are difficult to clean and should be removed.

Dehumidifiers were being operated in a number of areas in the basement (e.g., the DA's Office). Normally dehumidifiers are equipped with reservoirs to collect water, which should be emptied and cleaned as per the manufacturer's instructions to prevent bacterial and mold growth. Dehumidifiers in the building were equipped with drainage hoses that emptied directly outside the building (see Picture 4). However, the outlet for the hose sits over an inch from the base of the reservoir, which prevents water from completely draining. Standing water can become stagnant and provide a source of unpleasant odors and microbial growth. Standing water was observed in the dehumidifier in the conference room adjacent to room 28. In addition, the dehumidifier hose shown in Picture 5 is crimped which can prevent proper drainage and lead to microbial growth within the hose.

Water damaged building materials were observed in some areas, (most notably the main foyer (see Pictures 6 & 7)) are evidence of roof and/or plumbing leaks. Active/repeated areas of roof leaks were reported by occupants in the main foyer and in the hallway outside of room 12. Water-damaged building materials can provide mediums for microbial growth and should be replaced after a water leak is discovered.

Missing/damaged exterior caulking was noted around windows and wall panels (see Picture 8). Water penetration through window frames can lead to mold growth under certain conditions. Repairs of window leaks are necessary to prevent further water penetration. Repeated water damage can result in mold colonization of window frames, porous building materials and items stored on or near windowsills.

Several areas had water coolers installed over carpeting. Water spillage or overflow of cooler catch basins can result in the wetting of the carpet. Residue/build-up in the reservoirs of water coolers was also observed (see Pictures 9). The reservoirs of water coolers are also designed to catch excess water during operation and should be emptied/cleaned regularly to prevent microbial and/or bacterial growth.

Along the front of the building, shrubbery and plants were in close proximity to univent fresh air intakes (see Picture 10). Shrubbery and plants can be a source of mold and pollen and should be placed and/or maintained to ensure that fresh air intakes remain clear of obstructions.

According to court officials, the SDC has a history of flooding from backup from the municipal sewer system. The building was free of sewage odors on the day of the assessment. Building staff reported that sewage back up occurs occasionally in the restrooms located on the ground floor. In general, it is recommended that absorbent materials (e.g., gypsum wallboard, carpeting, fabrics, books, cardboard, etc.) be discarded once in contact with sewage (IICRC, 1999). Flooring and sub flooring (such as wood and tile) should be evaluated, cleaned, disinfected, dried and sealed when appropriate (IICRC, 1999). These measures should be implemented, if not taken previous to this BEHA assessment.

Other Concerns

Several conditions that can potentially affect indoor air quality were also identified. Construction of an elevator shaft was on-going during the BEHA assessment. Containment walls of plywood were erected and sealed with duct tape in some areas (see Pictures 11 & 12). BEHA staff observed spaces around containment walls through which light could be seen penetrating. Containment barriers should be as airtight as possible to prevent the migration of dust, odors and other renovation generated pollutants. Recommendations specifically regarding renovation of occupied buildings are included in the Renovations/Construction section of this report.

A number of photocopiers are located throughout the building. VOCs and ozone can be produced by photocopiers, particularly if the equipment is older and in frequent use. Ozone is a respiratory irritant (Schmidt Etkin, D., 1992). Without adequate mechanical exhaust ventilation, pollutants produced by office equipment can build up.

Missing/damaged ceiling tiles and open utility holes were seen in the basement hallway and in the civil/small claims area (see Picture 13). Missing ceiling tiles and open utility holes can provide a means of egress for odors, fumes, dusts and vapors between rooms and floors. In addition, these materials can migrate into the air handling chambers of unit ventilators and be distributed to occupied areas.

Justice Crimmins' restroom and the custodial closet were not equipped with local exhaust. These areas can be sources of moisture and odors. Without functioning exhaust ventilation, moisture and odors (from wet mops, cleaning agents, etc.) can migrate into adjacent areas.

Periodic sewer gas odors were reported by basement occupants. Odors were believed to be from a recently installed plumbing fixture located outside this area (see Picture 14). Another possible contributing source of odors is the univents. It appears that the original installation of the univent system was to include air conditioning. This conclusion is derived from the fact that each univent is equipped with a hard-plumbed condensation drain system (see Picture 15). The purpose of this type of drainage system is to remove water as it drips from the coils when the system operates in the cooling mode in warm weather. Since the HVAC system does not provide air conditioning, condensation is not drained by this system. Further, no traps were observed in univent condensation drainpipes (see Picture 15). Drains are usually designed with traps in order to prevent sewer odors/gases from penetrating into occupied spaces. When water enters a drain, the trap fills and forms a watertight seal. Without periodic input of water (e.g., every other day), traps can dry, preventing a watertight seal. Without traps, odors and other material can travel up the drain and enter occupied spaces. Sewer gas can be irritating to the eyes, nose and throat of some individuals. No sewer gas odors were detected during the BEHA assessment. Since these drain pans do not collect condensation, the drains should be sealed.

Spaces around pipes (see Picture 15) and the back wall (see Picture 16) were noted within all univent cabinet interiors surveyed. Accumulated debris was also observed in univent drip pans (see Picture 17). Note that a hole exists in the interior wall of the univent cabinet post filter. Holes in cabinets and spaces around pipes can serve as pathways for dust, dirt, odors and other pollutants to move from the floor/wall cavities into occupied areas during operation. These materials can be irritating to the eyes, nose and throat.

Several areas contained window-mounted air conditioners and/or portable air purifiers. These units are normally equipped with filters, which should be cleaned or changed as per the manufacturer's instructions to avoid the build up and re-aerosolization of dirt, dust and particulate matter.

Several basement areas have thick "shag" type carpet. Vacuum cleaners used at the SDC appear to be vintage equipment that is not outfitted with high efficiency particulate arrestance (HEPA) filtration (see Picture 18). Using equipment of this age can provide the opportunity for the reaerosolization of dirt, dust and particulates into the work environment.

Building occupants reported complaints of eye irritations. There are a number of inter-related issues that can contribute to this complaint. The most likely cause of eye irritation is the accumulation of dust on flat surfaces throughout the space. Dust can be irritating to the eyes, nose and respiratory tract. The large amount of items stored provides a means for dusts, dirt and other potential respiratory irritants to accumulate. These items, (e.g., books, shelves, boxes) make it difficult for custodial staff to clean.

In order to decrease aerosolized particulates, disposable filters with an increased dust spot efficiency can be installed in univents. Univents in the SDC were equipped with high efficiency pleated air filters. The dust spot efficiency is the ability of a filter to remove particulates of a certain diameter from air passing through the filter. Filters that have been determined by ASHRAE to meet its standard for a dust spot efficiency of a minimum of 40 percent (Minimum Efficiency Reporting Value equal to 9) would be sufficient to reduce many airborne particulates (Thornburg, D., 2000; MEHRC, 1997; ASHRAE, 1992). Note that increasing filtration can reduce airflow (called pressure drop), which can subsequently reduce the efficiency of the AHU due to increased resistance. Prior to any increase of filtration, each univent should be evaluated by a ventilation engineer to ascertain whether it can maintain function with more efficient filters.

Boiler room odors were detected in the basement hallway. BEHA staff observed the exterior door propped open, which can pressurize the boiler room under certain wind conditions, resulting in fuel odors penetrating into the adjacent areas.

Lastly, SDC staff frequently use a number of spray materials (see Pictures 19 & 19A) to clean work areas. Theses materials contain VOCs that can be irritating to the eyes, nose and throat. The conditions above, in combination with those discussed earlier, (e.g., inactive ventilation systems, non-HEPA vacuum cleaners in use) considered individually present conditions that could degrade indoor air quality. When combined, these conditions can serve to exacerbate conditions leading to eye irritations and other indoor air quality comfort complaints.

Conclusions/Recommendations

The conditions noted at the SDC raise a number of indoor air quality issues. The combination of the general building conditions, maintenance, design and the operation (or lack) of HVAC equipment, if considered individually, present conditions that could degrade indoor air quality. When combined, these conditions can serve to further negatively affect indoor air quality. Some of these conditions can be remedied by actions of building occupants. Other remediation efforts will require alteration to the building structure and equipment. For these reasons a two-phase approach is required, consisting of **short-term** measures to improve air quality and **long-term** measures that will require planning and resources to adequately address overall indoor air quality concerns.

The following **short-term** measures should be considered for implementation:

1. Implement recommendations listed in the MDLWD, 2000 report.
2. Examine each univent for function. Survey univents to ascertain if an adequate air supply exists for each room. Consider consulting a heating, ventilation and air conditioning (HVAC) engineer concerning the proper size/design of exterior air intakes and calibration of univent fresh air control dampers throughout the school.
3. To maximize air exchange, the BEHA recommends that ventilation systems throughout the building operate continuously during periods of occupancy independent of thermostat control. To increase airflow set univent controls to "high" and operate thermostats for AHUs in the fan "on" position.

4. Permanently seal the condensation drains in all univents ***NOT CONNECTED*** to an air conditioning system. This recommendation applies only to existing univents, not the newly installed HVAC system.

5. Examine the feasibility of installing an exhaust vent fan in the window of the shower/restroom adjacent to the DA's Office.

6. Reinstall the air conditioner in the DA's Office to the lower sash opening to direct air away from the ceiling system.

7. Consideration should be given to replacing ceiling tiles in the DA's office.

8. Consider installing exhaust ventilation in judge's lobby restrooms to remove odors and moisture.

9. Remove all blockages from univents to ensure adequate airflow. Consider reconfiguring cloth dividers in the civil small claims area.

10. Once both the fresh air supply and exhaust ventilation are functioning, the systems should be balanced by a ventilation engineering firm.

11. Until control of the building's HVAC systems is achieved, supplement airflow by using openable windows to control for comfort. Care should be taken to ensure windows are properly closed at night and weekends to avoid the freezing of pipes and potential flooding. Work with staff to determine which windows are unopenable/difficult to operate and make repairs.

12. Ensure that all subterranean pit drains are cleaned and fully functional.

13. Move foliage to a distance of at least five feet away from the foundation.

14. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be

adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

15. Trim plant growth away from air intakes to avoid the entrainment of moisture, pollen and mold.
16. Install backflow preventer on the sewer line top prevent further backups.
17. Consider placing a water impermeable barrier beneath water coolers and fountains to prevent moistening of carpets.
18. Replace missing ceiling tiles and fill utility holes, to prevent the egress of dirt, dust and particulate matter into classrooms.
19. Keep exterior door to boiler room shut to avoid over pressurization.
20. Relocate or consider reducing the amount of materials stored in common areas to allow for more thorough cleaning. Clean items regularly with a wet cloth or sponge to prevent excessive dust build-up.
21. Change filters for window-mounted air conditioners, AHUs and portable air purifiers as per the manufacturer's instructions or more frequently if needed.
22. Have ventilation engineer determine if univents can maintain function with currently installed high efficiency filters.
23. Clean univent return vents and exhaust vents periodically of accumulated dust.
24. Refrain from or reduce the use of strong scented/VOC-containing cleaning materials.

25. Contact a licensed plumber to inspect plumbing fixtures concerning the presence of sewer gas odors.

The following **long-term measures** should be considered:

1. Repair leaking roof. Once roof is repaired, replace any remaining water-stained ceiling tiles and other water damaged building materials. Examine the area above and around these areas for microbial growth. Disinfect areas of water leaks with an appropriate antimicrobial.
2. Examine the feasibility of installing fresh air intakes grilles of a more standard size to increase fresh air draw of the existing ventilation system.
3. Based on the age, physical deterioration and availability of parts of the HVAC system, the BEHA strongly recommends that the HVAC engineering firm fully evaluate the ventilation system for proper operation, and/or repair/replacement considerations.
4. Repair and/or replace thermostats and pneumatic controls as necessary to maintain control of thermal comfort. Consider contacting an HVAC engineer concerning the repair and calibration of thermostats and pneumatic controls building-wide.
5. Repair/replace missing or damaged window caulking building-wide to prevent water penetration through window frames.

Renovations/Construction

In addition to the steps previously noted, the following recommendations should be implemented in order to reduce the migration of renovation-generated pollutants into occupied areas. We suggest that many of these steps be taken on any renovation project within a public building:

1. Establish communications between all parties involved with building renovations to prevent potential IAQ problems. Develop a forum for occupants to express concerns about renovations as well as a program to resolve IAQ issues.
2. Develop a notification system for building occupants immediately adjacent to construction activities to report construction/renovation-related odors and/or dust(s) problems to the building administrator. Have these concerns relayed to the contractor in a manner to allow for a timely remediation of the problem.
3. When possible, schedule projects which produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
4. Disseminate scheduling itinerary to all affected parties. This can be done in the form of meetings, newsletters or weekly bulletins.
5. Use local exhaust ventilation and isolation techniques to control for renovation pollutants. Precautions should be taken to avoid the re-entrainment of these materials into the school's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring

systems are isolated from contaminated environments, sealing ventilation openings with plastic and utilizing filters with a higher dust spot efficiency where needed (SMACNA, 1995).

6. Obtain Material Safety Data Sheets (MSDS) for all construction materials used during renovations and keep them in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act (MGL, 1983).

7. Consult MSDS' for any material applied to the effected area during renovation(s) including any sealant, carpet adhesive, tile mastic, flooring and/or roofing materials. Provide proper ventilation and allow sufficient curing time as per the manufacturer's instructions concerning these materials.

8. Seal utility holes, spaces in floor decking and temporary walls to eliminate pollutant paths of migration. Seal holes created by missing tiles in ceiling temporarily to prevent renovation pollutant migration.

9. If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.

10. Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This may include constructing barriers, sealing off areas, and temporarily relocating furniture and supplies. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended.

11. Consider changing filters for HVAC equipment more regularly in areas impacted by renovation activities. Examine the feasibility of acquiring more efficient filters for these units.

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Picture 1

Univent Air Intakes

Picture 1A

Univent Fresh Air Intake At The Berkley Community School, Berkley, MA
(Compare The Size Of The Grille In This Picture Compared To The Windows, Then Compare To Picture 1)

Picture 1B

Univent Fresh Air Intake At The South Berkshire District Court, Great Barrington, MA (Compare The Size Of The Grille In This Picture Compared To The Windows, Then Compare To Picture 1)

Picture 2

Univents In Civil/Small Claims Area Obstructed By Cloth Partitions

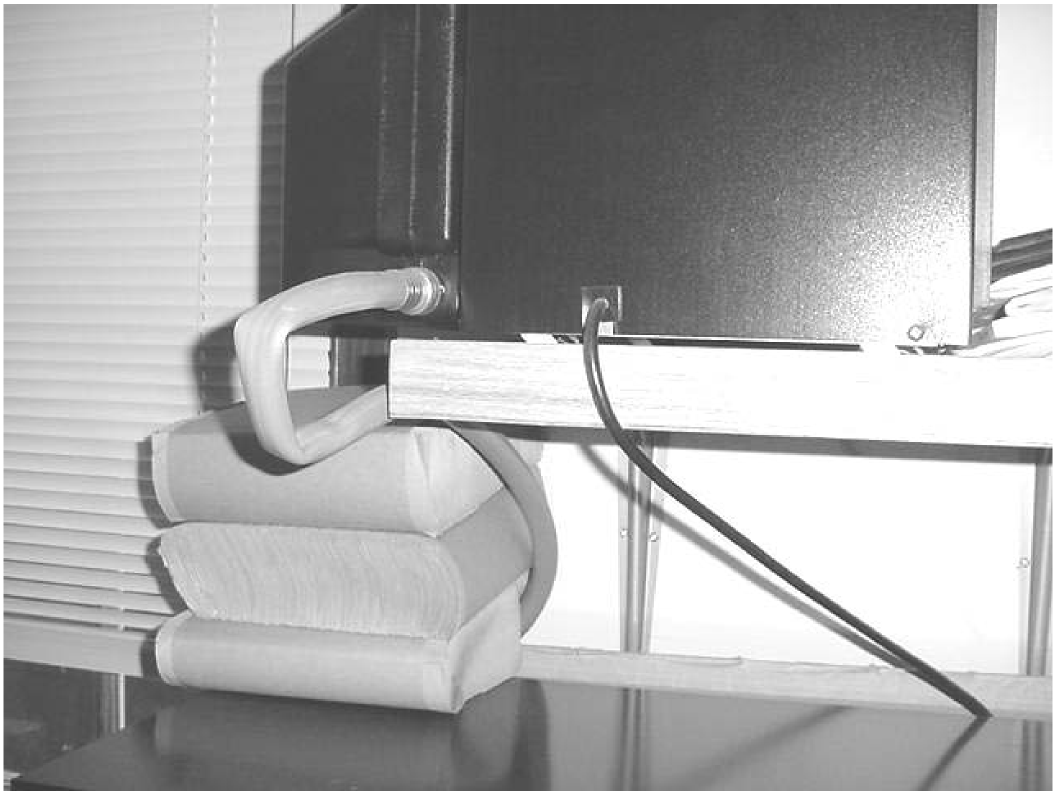
Picture 3

Univent Fresh Air Intake Located Near The Bottom Of A Subterranean, Cement Lined Pit

Picture 4

Dehumidifier In Basement Office With Hose Draining To The Outside Of The Building

Picture 5



Dehumidifier In Basement Office With “Kinked” Hose ”Preventing Proper Drainage

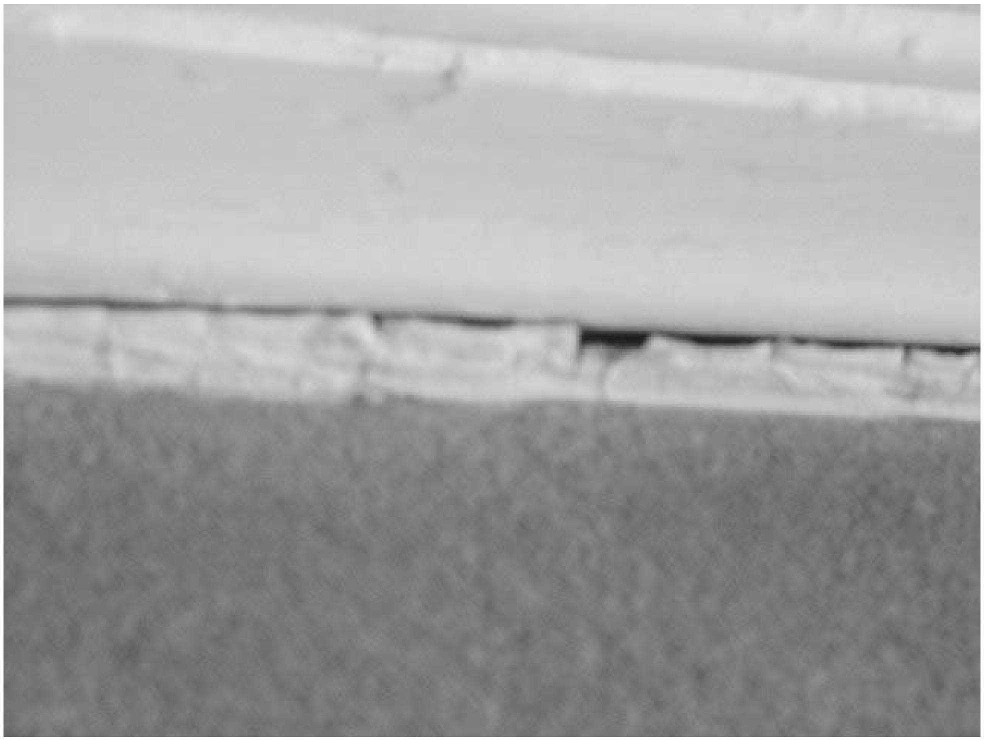
Picture 6

Water Damaged Ceiling Plaster In Main Foyer

Picture 7

Close-Up Of Water Damaged Ceiling Plaster

Picture 8



Missing/Damaged Caulking Around Exterior Wall Panel/Window Bank

Picture 9

Debris/Mold Growth In Water Cooler Catch Basin

Picture 10

Shrubbery Obstructing Univent Air Intake

Picture 11

Interior Shot Of Plywood Containment Wall, Note Spaces Between Panels

Picture 12

Occupied Side Of Plywood Containment Wall, Note Spaces Along Side Of Barrier Sealed With Duct Tape; Along The Top Is Not

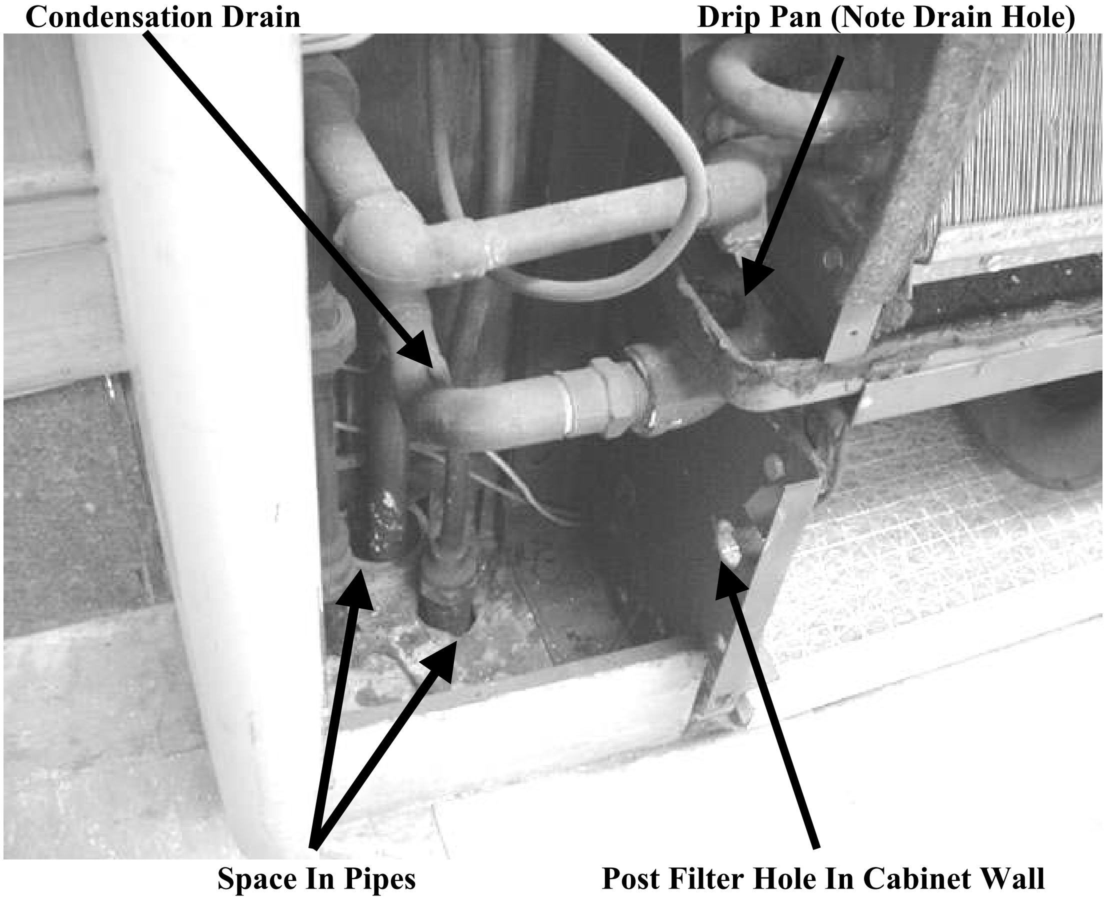
Picture 13

Open Utility Hole In Civil/Small Claims Area

Picture 14

Plumbing Fixture Outside Of Probation Offices

Picture 15



Interior Cabinet Unit Ventilator

Picture 16

Holes In Rear Wall Of Univent Cabinet

Picture 17

Debris/Mold Growth In Univent Drip Pan

Picture 18

Vacuum Cleaning Equipment Used At The SDC

Picture 19

VOC-Containing Spray Cleaners

Picture 19A

VOC-Containing Spray Cleaners, Note Warning Label

TABLE 1

Indoor Air Test Results – Stoughton District Courthouse, Stoughton, MA – June 5, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Outside (Background)	425	73	66					Weather conditions: cloudy/drizzle, SW wind 5-10 mph
Clerk Conference Room	1771	72	62	6	Yes	No	No	Wall-mounted air conditioner, 2 HEPA filters, wall-to-wall carpet (thick), photocopier, no mechanical ventilation
Basement Hallway								Spaces around wooden barrier (elevator shaft)
Magistrates Office	1344	73	57	0	Yes	No	No	Gypsum wallboard barrier
1st Floor Hallway								Plywood containment-spaces along top/sides/between boards
(6) Civil/Small Claims	1066	72	43	1	Yes	Yes	No	Photocopier, feather dusters/spray office cleaner-eye irritant, 2 univents-blocked by cloth divider, 2 a/c units
(8) Assistant Clerk's Office	1079	72	39	0	Yes	Yes	No	Dirt/dust accumulation on flat surfaces
Janitor's Closet						Yes	No	No exhaust vent, passive air intake
(10)	528	72	62	0	Yes	Yes	No	Window open, restroom exhaust

*** ppm = parts per million parts of air**
CT = ceiling tiles

Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred 600 - 800 ppm = acceptable > 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 2

Indoor Air Test Results – Stoughton District Courthouse, Stoughton, MA – June 5, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
(12) Juvenile –3rd Session	457	73	64	0	Yes	Yes	No	Window open, 2 univents
2nd Session	498	74	59	0	Yes	Yes	Yes	3 univents, exhaust off
Judge Ryan – Lobby	473	74	60	0	Yes	Yes	No	Carpet
(7) DA's Office	1500	76	53	2	Yes	Yes	No	Fan on top of univent-univent off, wall-mounted a/c
2	515	75	58	0	Yes	Yes	No	Photocopier, carpet
Judge Crimmins Chamber	584	75	58	0	Yes	Yes	No	Restroom-no exhaust, water cooler on carpet-debris in water cooler trough, dust/accumulated items on flat surfaces
3	731	77	47	0	Yes	Yes	No	Water cooler on carpet, restroom exhaust vent
Probation Office	660	75	47	5	Yes	Yes		Univent blocked by dividers, window open, photocopier, comfort complaints
Lobby	803							Current roof leaks, water-damaged ceiling

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Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 3

Indoor Air Test Results – Stoughton District Courthouse, Stoughton, MA – June 5, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Main Courtroom	833	71	36	0	Yes	No	Yes	Central HVAC currently being installed
Hallway Outside 12								Current roof leak
Boiler Room								Door wide open-pressurized, drafts
Storage Room 15					No	No	No	Files/boxes/old books-dusty/stale
Basement Hallway near 15								Utility holes
Andrews	990	74	60	1	Yes	No	No	Air purifier, wall-mounted a/c
Fitzsimmons	960	74	57	1	Yes	No	No	
28	889	75	55	0	Yes	No	No	
Conference Room	1000	71	56	0	Yes	Yes	No	Dehumidifier, missing CT, standing water-growth/scale
Associate Justice	790	71	52	0	No	No	No	Not currently occupied, no windows, no ventilation
26	652	72	56	0	Yes	Yes	No	Dusty fan

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Comfort Guidelines

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	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%

TABLE 4

Indoor Air Test Results – Stoughton District Courthouse, Stoughton, MA – June 5, 2002

Location	Carbon Dioxide *ppm	Temp. °F	Relative Humidity %	Occupants in Room	Windows Openable	Ventilation		Remarks
						Intake	Exhaust	
Basement Restroom (Men's)					No	Yes	Yes	
Basement Restroom (Women's)					No	Yes	Yes	Storage of boxes/plastic, baseboard coated with dust
Lock-up	766	71	65	3	Yes	No	No	Window open, exposed fiberglass, HVAC being installed, strong cigarette smoke odor
Prosecutor's Office	940	74	62	3	No	No	No	Air purifier
Criminal Office	802			2	No	Yes	No	Vent not operating, air purifier, plants
13	765	74	44	0	Yes	No	No	
1st Assistant Clerk	726		44	0	No	No	No	
Perimeter notes								Missing/damaged/cracking caulking around windows/panels

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CT = ceiling tiles

Comfort Guidelines

Carbon Dioxide -	< 600 ppm = preferred
	600 - 800 ppm = acceptable
	> 800 ppm = indicative of ventilation problems
Temperature -	70 - 78 °F
Relative Humidity -	40 - 60%